

HYDRAULIC EXCAVATOR, CRAWLER MOUNTED

1. SCOPE

1.1 Scope. This purchase description is applicable to diesel powered, crawler mounted, hydraulic excavators.

1.2 Classification. The excavator shall be of the crawler mounted, hoe type. The excavator shall operate under environmental climatic conditions from -25°F to 120°F without restrictions, and when specified, -40°F with the arctic cold weather starting kit. Throughout this document, hydraulic excavators will be called either "excavator" or "HYEX", the US Army's acronym for hydraulic excavators. The HYEX shall be of two class sizes which are defined as follows:

1.) The Type I and II HYEX is the heaviest excavator, with the highest digging forces, that has a transport height not exceeding 10'-2". Digging forces must be the highest possible to provide the Army the capability to perform excavating missions in the most difficult soil conditions (ie; caliche, frozen soil, shale, etc.) anywhere in the world. The Type II is the same base machine as the Type I, but is differentiated by having a rock drill as its principal third member attachment.

2.) The Type III HYEX is the heaviest excavator (not to exceed 75,000 lbs.) with a bucket digging force equal to, or greater than, 40,000 lbs and a stick force equal to, or greater than, 36,000 lbs. It will be used to excavate shot rock in a quarry.

The excavator shall have the following attachments (detailed specifications are outlined in paragraphs 3.2.6 through 3.2.6.2):

Type I	Type II
Hydraulic thumb	Rock drill
Heavy duty bucket	Heavy duty bucket
Utility bucket	

Type III
Rock bucket
Heavy duty bucket
Hydraulic impact breaker

2. DOCUMENTS TO BE USED BY THE CONTRACTOR TO MEET PURCHASE DESCRIPTION REQUIREMENTS

2.1 Government documents.

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2.1.1 Specifications and standards. The following specifications and standards form a part of this purchase description. The latest versions of these documents shall be used on the date the solicitation is released. These documents are listed in the Department of Defense Index of Specifications and Standards (DODISS).

(Unless otherwise indicated, copies of federal/military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

Standards

Federal

FED-STD-595 - Colors Used in Government Procurement

Military

MIL-T-704 - Treatment & Painting of Material

MIL-STD-209 - Slings and Tie down Provisions for Lifting and Tying Down Military Equipment

MIL-STD-1366 - Transportability Criteria

MIL-STD-1791 - Designing for Internal Aerial Delivery in Fixed Wing Aircraft

MIL-G-10924 - Grease, Automotive and Artillery

MIL-L-2104 - Lubricating Oil, Internal Combustion Engine, Combat and Tactical Service/Tactical Services

MIL-L-2105 - Lubricating Oil, Gear, Multipurpose

MIL-L-46167 - Lubricating Oil, Internal Combustion Engine, Arctic

MS52131 - Connector, Plug, Electrical Intervehicular Power Cable

(Copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, ATTN: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings, and publications.

MILITARY TRAFFIC MANAGEMENT COMMAND TRANSPORTATION ENGINEERING AGENCY (MTMC TEA)

REFERENCE 94-70-1 - Transportability and Deployability for Better Strategic Mobility

(Application for copies should be addressed to the Military Traffic Management Command Transportation Engineering Agency, ATTN: MTTE-TR, 720 Thimble Shoals Blvd, Suite 130, Newport News, VA 23606-2574)

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**US ARMY TANK-AUTOMOTIVE & ARMAMENTS COMMAND (TACOM)
DRAWING NUMBER 7064504 - Bracket Assembly, Liquid Container, Five
Gallon**

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, INC. (ASME)

**Boiler and Pressure Vessel Code, Section IX Qualification Standard for
Welding and Brazing Procedures, Welders, Brazers and Welding and
Brazing Operators.**

**(Application for copies should be addressed to the American Society of Mechanical
Engineers, Inc., 345 East 42nd Street, New York, NY 10017.)**

AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1 - Structural Welding Code - Steel.

**AWS D14.3 - Earth moving and Construction Equipment Welding, Section
5.**

**(Application for copies should be addressed to the American Welding Society, Inc., 550 NW
LeJeune Road, Miami, FL 33126.)**

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Z535.1 - Safety Color Code

Z535.3 - Criteria for Safety Symbols

Z535.4 - Product Safety Signs and Labels

**(Applications for copies should be addressed to the American National Standards Institute,
Inc., 1430 Broadway, New York, NY 10018)**

ASSOCIATION OF AMERICAN RAILROADS (AAR)

**General Rules Governing the Loading of Commodities on Open-Top Cars
and Trailers**

**(Application for copies should be addressed to the IRF, 525 School St., Washington, D.C.
20024)**

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

J88 Sound Measurement - Earth moving Machinery - Exterior

J98 Personnel Protection for General Purpose Industrial Machines

**J296 Excavator, Mini-excavator, and Backhoe Hoe Bucket Volumetric
Rating**

J674 Safety Glazing Materials - Motor Vehicles

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J753	Lubrication Chart - Construction and Industrial Machinery
J833	USA Human Physical Dimensions
J919	Sound Measurement - Earth moving Machinery Operator Singular Type
J925	Minimum Service Access Dimensions for Off-Road Machines
J1013	Measurement of Whole Body Vibration of the Seated Operator of Off-Highway Work Machines
J1069	Oil Change System for Quick Service of Off-Road Self-Propelled Work Machines
J1097	Hydraulic Excavator Lift Capacity Calculation and Test Procedure, Standard
J1166	Sound Measurement - Off-Road Self-Propelled Work Machines - Operator - Work Cycle
J1179	Hydraulic Excavator and Back Hoe Digging Forces
J1503	Performance Test for Air-Conditioned, Heated and Ventilated Off-Road Self-Propelled Work Machines

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

2.3 Order of precedence. In the event of a conflict between the text of this purchase description and the references cited [except for associated detail specifications or Military Standards (MS)], the text of this purchase description shall take precedence. Nothing in this purchase description, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 HYEX tests and inspections. The HYEX shall be subjected to testing and inspection as described in paragraphs 4.3 through 4.3.9.

3.2 Description and characteristics. All excavators provided in accordance with this purchase description shall be the manufacturer's current commercial production model equipped with all components furnished as standard equipment and features customarily furnished with excavators of this type, whether stipulated herein or not. The excavator shall have a diesel engine, be crawler mounted, have an upper structure capable of continuous 360° rotation, and which digs, elevates, swings, and dumps material by action of the boom, the arm, and the bucket. Manufacturer decals, logos and model numbers shall not be permitted to be displayed on the HYEX, except for manufacturer name and model number on the identification plates.

The Type I and II excavators shall have the highest operating weight that can meet the following characteristics:

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- a. Maximum possible bucket and stick forces capable of penetrating and excavating very difficult soils (such as caliche) and conditions (such as frozen soils).**
- b. Lift capacity, for Type I excavator, (per SAE J1097), over the side, shall not be less than 15,000 lbs at a 15 feet radius, at ground line.**
- c. Minimum horizontal bucket reach at ground level of 30 feet.**

The Type III excavator shall have the highest operating weight that can meet the following characteristics:

- d. Bucket digging force equal to, or greater than, 40,000 lbs., without coupler (per SAE J1179).**
- e. Stick digging force equal to, or greater than, 36,000 lbs., without coupler (per SAE J1179).**
- f. Lift capacity (per SAE J1097), over the side, shall not be less than 15,000 lbs. at a 15 ft radius, ground line.**
- g. Minimum horizontal bucket reach at ground level of 30 feet.**
- h. Operating weight not to exceed 75,000 lbs.**

3.2.1 Work lights. The upperstructure shall be furnished with work lights at front and rear. Two overhead lights mounted on the cab, two boom mounted lights, and two rear mounted lights shall be furnished. They shall be easily adjustable and located to illuminate maximum work area.

3.2.2 Cab. All windows shall be safety type glass conforming to the guidelines of SAE J674. The seats shall be adjustable to accommodate 5th percentile female through 95th percentile male personnel, located to provide maximum unobstructed visibility for the operator, and be provided with the manufacturer's retractable seat belts. The cab shall be equipped with all manufacturer's standard commercial features to include as a minimum: air conditioner, heater, defroster, and electrically operated windshield wiper(s). The heater shall meet the heating requirements of SAE J1503. An electric or air horn shall be provided. The defroster shall defrost the front and side windows. A vandalism protection kit shall be provided. For the Type III, wire mesh window protection shall be provided to protect against damage when using the impact breaker. The wire mesh window protection shall be used as a substitute for the vandalism protection for the front window. The vandalism protection kit shall be provided for the remaining windows on Type III vehicles. Provisions shall be made for storing an M16A1, M16A2, or M4 rifle in a bracket inside the cab. The rifle stowage bracket shall be located inside the cab so that the rifle is accessible to the operator and have enough clearance for easy removal. The rifle, while

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mounted in the bracket, shall be located away from operator's controls, not obstruct the vision of the operator, and be within arm's reach of the operator. Two "J" hooks shall be mounted behind the operator's seat to hang the soldier's Load Bearing Equipment (LBE) and individual chemical equipment bag. The hooks shall protrude from the mounting surface no less than 1 inch, have approximately 24 inches of clearance below them, and be capable of supporting 50 lbs. of weight.

3.2.2.1 Air conditioning. The air conditioning system shall be equipped with the following service ports: discharge, suction, and recovery. The recovery port shall be positioned to allow recovery of liquid refrigerant. The refrigerant, if used with any kit, shall be R-134a, and all materials in the system shall be compatible with R-134a and ester lubricants. The air conditioner shall be designed to operate in the cooling mode at ambient temperatures between 65° and 120°F and shall meet the cooling requirements of SAE J1503.

3.2.3 Swing stop device. A means capable of locking the upperstructure in position shall be provided. The swing stop controls shall be of the automatic type, with provisions made for easy adjustment. The swing stop must be an automatic brake and the swing function (must be non-directional) and equal strength in both directions.

3.2.4 Boom and stick. The excavator shall be supplied with manufacturer's standard boom and stick.

3.2.5 Attachment hydraulic quick connect/disconnect coupler. All HYEX's shall be fitted with a hydraulic quick connect/disconnect coupler system and shall be compatible with attachments. The operation shall not take more than 15 minutes time to switch from one attachment to another (with the exception of the rock drill). It shall be self-adjusting to compensate for wear, have positive tool retention, and have a connection point for lifting. No special tools shall be used to operate coupler with attachments.

3.2.5.1 Hydraulic hose couplings/fittings. All HYEX's and attachments that require hydraulic fluid for operation shall have hydraulic hose quick couplings located within easy reach of the attachments. The use of a manual shut-off valve with a standard fitting in lieu of a quick coupler is acceptable for use with the impact breaker. All couplings shall have tethered metallic captive sealing and/or plugs caps to close off hose when not in use. Means shall be provided to prevent high pressure static fluid from preventing couplings from connecting. The connected couplings and disconnected halves shall withstand a surge pressure of 150 percent (minimum) of the relief valve setting without leakage or rupture. When in use, the couplings shall show no external leakage.

3.2.6 Attachments for Type I. The following attachments shall be furnished:

- a. Heavy duty bucket (for general purpose excavating and in material such

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as dense clay and light rock)

SAE J296 heaped capacity: minimum 1.5 cu. yards

Material density rating: minimum 3,000 lbs/yd³

Outside lip width: 42 inches

Teeth: 5, cast with pick-shaped point

Wear protection: cast-alloy wing shrouds and full-width bottom runner

b. Utility bucket, minimum 1.33 cu. yds., and 60 in. wide.

SAE J296 heaped capacity: minimum 1.33 cu. yards

Material density rating: minimum 3,000 lbs/yd³

Outside lip width: 60 inches

Teeth: none

Wear protection: full-width bottom runner

c. Hydraulic thumb clamp configured to work with heavy duty and utility buckets (a. and b., above). Thumb shall fully retract, or fold back, when not in use, enabling unhampered use of bucket(s).

3.2.6.1 Attachments for Type II. The following attachments shall be furnished:

a. A percussive, top hammer type, hydraulic rock drill with the following features and operating characteristics:

- (1) Capability of drilling stone having a minimum compressive strength of 32,000 psi.
- (2) Single pass minimum of 12 feet, 13 feet maximum.
- (3) Rod changer with a minimum capacity of 4 rods, 6 maximum.
- (4) Minimum drilling rate in granite: 2 to 4 feet per minute.
- (5) Drill bits: retrac type drop center button bit, 3.5 inch diameter and 4.5 inch diameter.
- (6) Drilling rods and accessories: T-51 drill rod; shank adaptors; and couplings.
- (7) Drilling depth minimum of 36 feet with rod changer
- (8) Hole size from a minimum of 3 inches to not more than 4.5 inches in diameter.
- (9) Feed swing minimum of 20 degrees, right and left.
- (10) Hydraulic centralizer.

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- (11) Hole cleaning with up hole air velocity minimum of 3,000 ft./min.(up to a 4 in. diameter hole).
- (12) Drill rod greasing capability for coupling, cab controlled.
- (13) Cab mounted control panel to operate all rock drill functions.
- (14) Air compressor with an alcohol evaporator and a minimum capacity of 300 cfm at 125 psi unloaded pressure.
- (15) Dust collector (dry type) with a minimum suction capacity of 800 cfm
- (16) Minimum impact energy of 350 ft-lbs.
- (17) Minimum impact frequency of 1800 blows/min.
- (18) Minimum rotation torque 650ft-lbs.
- (19) Foot pad capable of supporting the operating weight of the excavator.

b. Heavy duty bucket (for general purpose excavating and in material such as dense clay and light rock)

SAE J296 heaped capacity: minimum 1.5 cu. yards

Material density rating: minimum 3,000 lbs/yd³

Outside lip width: 42 inches

Teeth: 5, cast with chisel-shaped point

Wear protection: cast alloy wing shrouds and full width bottom runner

3.2.6.2 Attachments for Type III. The following attachments shall be furnished:

a. Heavy duty bucket (for general purpose excavating and in material such as dense clay and light rock)

SAE J296 heaped capacity: minimum 2.0 cu. yards

Material density rating: minimum 3,000 lbs/yd³

Outside lip width: 48 inches

Teeth: 5, cast with pick-shaped point

Wear protection: cast alloy wing shrouds and full width bottom runner, minimum 1/2 inch thick

b. Rock bucket (for shot rock)

SAE J296 heaped capacity: minimum 1.75 cu. yards

Material density rating: minimum 3,000 lbs/yd³

Outside lip width: 42 inches

Teeth: 5, cast with pick-shaped point

Wear protection: cast alloy wing shrouds and full width bottom runner

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- c. Impact breaker with the following requirements: 3rd-member mounting to quick coupler, minimum impact energy of 5,000 ft-lbs, minimum operating weight of 5,500 lbs., minimum of 450 full stroke blows/min., and a minimum tool diameter of 5.5 inches. Each excavators shall be supplied with a moil point (1 each), a chisel point (1each), and a blunt point (1 each).

3.2.7 Crawler track shoes. Crawler track shoes for the Type I shall have a minimum width of 31 inches and the Type II and III shall have a maximum width of 24 inches.

3.3 Hazardous materials. Asbestos, Cadmium, and radioactive material shall not be used in any components of the excavator.

3.4 Maintainability. All provisions shall be made for ease of adjusting, servicing, or replacing parts and components and shall conform to the recommendations of SAE J925.

3.5 Safety. A fire extinguisher with a minimum rating of 10 B:C shall be securely installed in a location readily accessible to the operator. A travel alarm shall be provided with an on/off switch. A warning placard shall be placed in the excavator cab that warns the operator of unsafe operating conditions with regard to overhead electrical power lines. A lift overload alarm shall be provided to warn operator that the object being lifted exceeds the excavators side lift capacity. The alarm signal shall activate when the payload reaches 90% of the excavator's rated side lift capacity at maximum reach. The boom's hydraulic circuit shall have a check valve to prevent it from suddenly dropping in the event of a catastrophic fluid loss. The HYEX shall meet personnel protection requirements of SAE J98.

3.5.1 Noise limits. The exterior sound level of the excavator shall be measured in accordance with SAE J88, J919 and J1166. If the sound level in the area occupied by the operator or surrounding area is 85db(A) or greater, a warning plate in accordance with ANSI Z535.1 shall be permanently affixed by bolts, rivets, or screws in a conspicuous protected location at the operators control station. Discussion of noise hazards shall be addressed in the operators technical manual and shall include the type of hearing protection required, the noise level of the equipment at the locations tested, and the distances at which the 85db(A) level will be met.

3.6 Human factors engineering. The excavator shall be operable and maintainable in accordance with the recommended practices defined in SAE J833 by soldiers dressed in environmental protective clothing (i.e.; Arctic and

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Mission-Oriented Protective Posture (MOPP) IV). Excavator induced vibrations to the operator shall be measured in accordance with SAE J1013.

3.7 Hydraulic system. The hydraulic system shall contain an electronic load sensing system to maximize performance and safety. The pump(s) shall be driven by the excavator engine and shall have sufficient capacity to operate all hydraulically-powered attachments. Hydraulic tank oil temperature shall not exceed 200°F with an ambient temperature of 120°F while performing sustained excavating operations.

3.7.1 Hydraulic hand tools. A hydraulic pressure and return circuit is to be provided to operate hand held tools for Type I & II HYEXs. The circuit must provide a controlled pressure source with adjustable flow rates between 8 and 12 GPM with adjustable nominal pressure limit of 2,000 psi. Fifty feet of 1/2 in. pressure and return hose is to be provided on a retracting reel, located on the cab side of the excavator. The connection to the hand tools shall be with 3/8 in. couplers from Aeroquip, part numbers FD49-1001-06-06 (female, return) and FD49-1002-06-06 (male, pressure) or, the equivalent from Bruning, part numbers FF3718F0-8SAE (female, return) and FF3728F0-8SAE (male, pressure).

3.8 Engine. The diesel engine, including all systems and accessories, shall conform to year of manufacture for non-road EPA emission standards. The diesel engine shall have the capability to operate with diesel fuel oil and aviation, kerosene type turbine fuel, grade JP-8. Fuel tank filler necks shall have a minimum size of 1.5 inches outside diameter with removable screen and filler neck with sufficient air release clearance. The fuel type shall be stenciled near fuel cap in letters not less than 1 inch letter height. A fuel tank drain petcock valve located at the lowest point shall be furnished. The fuel tank shall have a capacity for 10 hours of continuous excavating.

3.8.1 Instrumentation. The instrument panel shall contain the manufacturer's standard array of controls and instrumentation to include those necessary to operate options (e.g., unassisted cold start control) and attachments.

3.8.2 Air cleaner. The air cleaner shall be of the dry type with a pre-cleaner and automatic dust ejection.

3.9 Lubricants. Initial fill lubricants, if non-military, shall fully conform to the following requirements:

- a. All engine and hydraulic systems: MIL-L-2104, or when required for Arctic conditions: MIL-L-46167.
- b. General lubrication: MIL-G-10924.
- c. Final drives: MIL-L-2105.

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3.9.1 Lubrication data plates. A lubrication data plate shall be provided (attached by screws, bolts, or rivets in a conspicuous protected location) and conform to guidelines of SAE J753. The plate shall identify military lubricants and their commercial equivalents, to include all lubrication points.

3.9.2 Lubrication fittings. Fittings shall be located in a protected, accessible location. Fittings shall be accessible to a grease gun with a 10 inch flexible extension. Fittings shall be accessible without removing or adjusting accessories or parts. Extended lubrication points shall be used for hard to reach areas and be accessible to an operator standing on the ground.

3.10 Oil sampling valve. Oil sampling valves shall be provided on the engine and hydraulic system. The valves shall be located to insure that personnel will not be exposed to danger when taking oil samples with the engine running. The valves shall be located to insure that the sample taken is a true representation of flowing oil while the engine is running. The valve shall be manually operated and automatically close after release. The discharge port of the valve shall be covered with a captive chained threaded cap which provides a positive seal for the sampling port. The location of each oil tap shall be upstream of system filtration. The hydraulic sampling valve shall be in the return or low pressure side of the hydraulic system. The sampling valve shall be labeled adjacent to the valve indicating the direction for "OPEN" and the type of oil sampled (engine or hydraulic, as applicable).

3.11 Fluid drains. The HYEX shall have an oil change system for quick service and conforming to the recommended practice of SAE 1069.

3.12 Low temperature start and operation. The excavator shall start within 5 minutes and operate within 15 minutes of starting while in the temperature range of 120°F to -25°F without the use of an external starting aid or arctic/cold weather starting kit. The excavator shall start within 45 minutes and operate within 15 minutes from -25°F to -40°F with the use of an arctic/cold weather starting kit. For the purposes of this paragraph, "operating" is defined as the ability to actuate all hydraulic functions throughout their full range of movement and the ability to move in both forward and rearward direction

3.13 Electrical system. The excavator shall have a 24-Volt negative ground electrical system with a 24-Volt starting motor and a heavy duty battery charging alternator. All electrical connectors that have the potential for exposure to rain or pressure spray cleaning shall be sealed against moisture penetration.

3.13.1 Batteries and cables. The battery shall have sufficient cold cranking amperage to start the excavator at -25°F. When the arctic/cold weather starting kit is provided, the battery shall have sufficient cold cranking amperage to start

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the excavator -40°F. Battery cables shall be furnished with insulated terminal covers. Positive and negative cable terminals shall be identified with a red sleeve labeled " + " and a black sleeve labeled " - ", respectively, and corrosion resistant bolts and nuts provided.

3.13.2 Slave receptacle. The excavator shall be equipped with a 24-Volt slave receptacle conforming to MS52131. The slave receptacle shall permit charging of the batteries and slave starting of the engine from an external power source and shall also provide a power source for charging and slaving other equipment. The receptacle shall be installed on the exterior of the excavator near the battery enclosure and shall be accessible to personnel standing on the ground. The receptacle shall be marked "SLAVE 24 VOLTS DC".

3.14 Tool/Storage box. A tool/storage box shall be provided on each excavator and shall be of sufficient size to accommodate the necessary tools to perform routine operator services and maintenance. The box cover shall be secured using a padlock eye minimum size of 0.625 inches. A keyed padlock of suitable size shall be provided. Means for drainage of the box shall be provided and the opening shall be located for accessibility for 5th through 95th percentile operators.

3.15 General transport requirements. The excavator shall have the capability of being transportable worldwide by rail, marine, highway, and air modes. Guidance on transportability criteria are defined in MIL-STD-1366. Transport height for the Type I/II shall not exceed 122 inches (10'- 2"). Transport height for the Type III shall not exceed 142 inches (11'- 9"). Small components and accessories removed for transport shall either fit into the tool/storage box or have provisions for stowage on the vehicle. Disassembly of major components (i.e.; stick), except attachments and bucket/stick cylinders, shall not be allowed. Disassembly time of attachments and bucket/stick cylinders shall not exceed 2 hours. Removal of components or attachments shall be acceptable only if these items can be safely stored on the trailer and meet the requirements of MIL-STD-209.

3.15.1 Rail transport. The excavator shall be capable of withstanding shock loads resulting from a rail impact test in accordance with the AAR, without degradation, or damage. When loaded on a fifty inch high rail car, the excavator shall meet the dimensional requirements of the Department of Defense (STRACNET) rail clearance diagram (See Reference 94-70-1 - Transportability and Deployability for Better Strategic Mobility, page 31.)

3.15.2 Marine transport. The excavator shall be transportable on breakbulk (general cargo), RORO, and barge carrying (LASH and SEABEE) ships without disassembly. The excavator shall also be transportable on the LARC-LX and larger tactical lighterage.

3.15.3 Highway transport. The excavator shall be highway transportable by the M916/M920/M870 tractor/semi-trailer combination. If disassembly of

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bucket/stick cylinders is required, and the stick cannot be laid flat on the trailer bed for its final transport mode, then a support shall be supplied to prop up the stick in a safe static position. The support shall be attached and be integral to the stick or boom. The support shall have a preset height to allow personnel to

attain correct alignment (during disassembly/assembly) with little or no difficulty. The bracket shall be strong enough to support the combined weight of the stick and boom with a minimum safety factor of 1.25. The HYEX shall have tiedown provisions located in such a manner that their locations are compatible with the tiedown locations of the M870 trailer.

3.15.4 Air transportability. The excavator, in its shipping configuration, shall meet MIL-STD-1791 by being roll-on/roll-off transportable on C-5 and C-17 aircraft.

3.15.5 Slings and tiedown provisions. The tiedown provisions shall permit the tiedown of the excavator, components, and attachments to the platform (or deck) of the transport medium to restrict shifting or movement in any direction. All slinging and tiedown provisions shall be labeled "LIFT", "TIEDOWN", or "LIFT/TIEDOWN", as applicable, in 1 inch high letters. Slinging and tiedown provisions shall satisfactorily complete the testing as specified in MIL-STD-209 (4.3.8) without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural component. Spreader bars, when required, shall be an integral part of the equipment or provided as a separate component(s). Provisions shall be provided for storage, if separately provided, to insure that they remain with the equipment.

3.16 Identification and marking. The excavator shall be furnished with an identification plate showing the contractor's model number, national stock number (NSN), USA registration number, date of manufacture, contractor's name, and contract number. The plate shall be affixed to the excavator in a conspicuous location and be attached by screws, bolts or rivets. Any components, if removed or disassembled for transport, shall be match marked for proper re-assembly. Registration numbers will be furnished by the contracting officer and stenciled on the unit.

3.16.1 Instruction plates. The excavator shall be equipped with instruction plates, or diagram plates, describing procedures to be followed for operating, servicing, and lubrication. Plates describing safety measures, cautions or warnings against operations detrimental to the excavator shall be in accordance with ANSI Z535. Plates shall be attached by screws, bolts, or rivets in a conspicuous protected location.

3.16.2 Shipping data plate. Each excavator shall be furnished with a shipping plate. All shipping data plates shall show a silhouette of the excavator in transport configuration indicating the center of gravity and the location and capacity of the slinging and tiedown provisions. The plates shall be attached by screws, bolts or rivets in a conspicuous protected location.

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3.16.3 Warranty data plate. Each excavator shall be furnished with a warranty data plate. The plate shall contain the following information:

- a. Date the warranty commences.
- b. Warranty period.
- c. Contract number.
- d. Manufacturer's name.
- e. Date of manufacture.

The plate shall be attached by screws, bolts or rivets in a conspicuous protected location.

3.17 Paint. All portions of the vehicle(s) commercially painted shall be cleaned, treated, and painted in accordance with MIL-T-704, type F or G, as applicable. When specified, the top coat color shall be 34094 green 383 or 33446 tan 686 conforming to FED-STD-595, with the exception of components that are not visible during normal operation may be painted with the manufacturer's commercial paint. High temperature surfaces (e.g., exhaust stacks) shall not be painted with CARC paint but rather high temperature paint in a color consistent with vehicle paint requirements (e.g., green 383) or in accordance with manufacturer's commercial paint practices. The HYEX's weight classification number (number and exact location to be provided by the contracting officer) shall be painted on the front right side of the superstructure. The number shall be black, 3.5 inches in height, in a Gothic font, and centered within a 9 inch diameter circle. The circle shall be black and have a width of 1/4 inch.

3.18 Welding. Welding procedures and welds shall be in accordance with ASME or AWS codes.

3.19 Decontamination kit bracket. A decontamination kit bracket shall be mounted and be accessible by personnel standing on the ground. It shall be located to provide sufficient clearance to remove and emplace the Army's standard 5-gallon gasoline can. The bracket shall conform to TACOM drawing number 7064504.

4. TESTS & QUALITY ASSURANCE PROVISIONS

4.1 Quality assurance information for the Contractor. Quality assurance inspections and tests shall occur in two phases:

- I. Quality assurance inspections and certifications of first excavator(s) at the manufacturer's factory.
- II. First article tests and/or inspections of first excavator(s) at a Government test site.

The absence of any inspection requirements within this purchase description shall not relieve the contractor of the responsibility for assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Unless otherwise specified within the contract or purchase description, the contractor is responsible for the execution of all inspections and certifications as stated in this purchase description. The contractor is responsible for ensuring that components and materials are manufactured, inspected, and tested in accordance with referenced specifications and standards, as applicable. Failure to comply with any of the requirements (paragraph 3.1 through 3.20) shall be cause for rejection.

4.1.1 Quality assurance at manufacturing plant. The first excavators at the manufacturer's factory shall be inspected and/or tested as outlined in paragraph 4.2, Table 1., column I., and shall become part of the contractor's existing quality control system.

4.1.2 First article tests/inspections. Excavators that have met all inspection, test, and certification requirements at the factory, shall be shipped to a Government test site and subjected to first article tests and/or inspections as outlined in paragraph 4.2, Table 1., column II. Tests shall be conducted using aviation, kerosene type turbine fuel, grade JP-8. If required, excavators shall be subjected to the manufacturer's break-in procedure/duration prior to testing.

4.2 Test and inspection schedule.Table 1. Test and Inspection Schedule

KEY: I = Inspection, T = Test, and C = Contractor certification

	Requirement Title/Description	Requirement Paragraph	Test Description Paragraph	I. First Excavator(s)at Contr. Factory	II. Gov't Test and/or Inspection
100	Description and characteristics	3.2		I	
101	Type I/II bucket & stick forces	3.2, a.		C ₁	
102	Type I/II lift capacity	3.2, b.		C ₁	
103	Type I/II max. bucket reach	3.2, c.		C ₁	
104	Type III bucket digging force	3.2, d.		C ₁	
105	Type III stick digging force	3.2, e.		C ₁	
106	Type III lift capacity	3.2, f.		C ₁	
107	Type III max. bucket reach	3.2, g.		C ₁	
108	Type III operating weight	3.2, h.		C ₁	I/T
109	Work lights	3.2.1		I	
110	Cab	3.2.2		I	
111	Air conditioning	3.2.2.1		I	T
112	Swing stop device	3.2.3		I	
113	Boom and stick	3.2.4		I	
114	Attachment quick coupler	3.2.5	4.3.1	I	T
115	Hydr. hose couplings/fittings	3.2.5.1	"	I	T
116	Attachments, Type I HYEX	3.2.6		C ₂	
117	Heavy duty bucket	3.2.6, a.		I	I
118	Utility bucket	3.2.6, b.		I	I
119	Hyd. thumb clamp	3.2.6, c.		I	I
120	Attachments, Type II HYEX	3.2.6.1		C ₂	
121	Rock drill	3.2.6.1, a.	4.3.2	I	T
122	Rock drilling capability	3.2.6.1, a, 1.	"	C ₂	T
123	Pass length	3.2.6.1, a, 2.	"	I	
124	Rod changer	3.2.6.1, a, 3.	"	I	T
125	Drilling rate	3.2.6.1, a, 4.	"	I	T
126	Drill bits	3.2.6.1, a, 5.	"	I	T
127	Drilling rods and accessories	3.2.6.1, a, 6.	"	C ₂	
128	Drilling depth	3.2.6.1, a, 7.	"	I	T
129	Hole sizes	3.2.6.1, a, 8.	"	I	T
130	Feed swing	3.2.6.1, a, 9.	"	I	T
131	Hydraulic centralizer	3.2.6.1, a, 10.	"	I	T
132	Hole cleaning	3.2.6.1, a, 11.	"	I	T
133	Cab controlled greasing of drill rod	3.2.6.1, a, 12.	"	I	T
134	Rock drill control panel	3.2.6.1, a, 13.	"	I	T
135	Air compressor	3.2.6.1, a, 14.	"	I	T
136	Dust collection system	3.2.6.1, a, 15.	"	I	T

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137	Impact energy	3.2.6.1, a., 16.	"	C ₁	
138	Impact frequency	3.2.6.1, a., 17.	"	C ₁	
139	Rotation torque	3.2.6.1, a., 18.	"	C ₁	
140	Foot pad	3.2.6.1, a., 19.	4.3.2	I	T
141	Heavy duty bucket	3.2.6.1, b.		I	I
142	Attachments, Type III HYEX	3.2.6.2		I	
	Requirement Title/Description	Requirement Paragraph	Test Description Paragraph	I. First Excavator(s)at Contr. Factory	II. Gov't Test and/or Inspection
143	Heavy duty bucket	3.2.6.2, a.		I	I
144	Rock bucket	3.2.6.2, b.		I	I
145	Hydraulic impact breaker ²	3.2.6.2, c.	4.3.3	I	T
146	Crawler track shoes	3.2.7		I	I
147	Hazardous materials	3.3		C ₁	
148	Maintainability	3.4		I	I
149	Safety	3.5		I	I/T
150	Noise	3.5.1	4.3.3	I	T
151	Human factors	3.6	4.3.4	I	T
152	Hydraulic system	3.7		I	
153	Hydraulic hand tools	3.7.1		C/I	I
154	Engine	3.8	4.3.5	I	T
155	Instrumentation	3.8.1		I	
156	Air cleaner	3.8.2		I	
157	Lubricants	3.9		C/I	I
158	Lubrication data plates	3.9.1		I	I
159	Lubrication fittings	3.9.2		I	
160	Oil sampling valve	3.10		I	
161	Fluid drains	3.11		I	
162	Low temp start and operation test	3.12	4.3.6	I	T
163	Electrical system	3.13		I	
164	Batteries and cables	3.13.1		I	
165	Slave receptacle	3.13.2		I	
166	Tool/storage box	3.14		I	I
167	General transport requirements	3.15		I	I
168	Rail transportability	3.15.1	4.3.7		T
169	Marine transport.	3.15.2			I
170	Highway transport.	3.15.3	4.3.8		T
171	Air transportability	3.15.4			I
172	Slings and tiedown	3.15.5	4.3.9	I	T
173	Identification/markings	3.16		I	
174	Instruction plates	3.16.1		I	
175	Shipping data plate	3.16.2		I	
176	Warranty data plate	3.16.3		I	
177	Paint	3.17		I	
178	Welding	3.18		C	
179	Decontamination kit bracket	3.19		I	

¹ Contractor must provide certified test data to confirm meeting Government requirements.

² Denotes feature or factory option for selected excavators only.

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4.3 Tests. The following tests shall be conducted to verify conformance with the requirements in section 3. Inability of the excavator(s) and its attachments to meet form, fit, or function shall constitute failure of the test.

4.3.1 Hydraulic quick connect/disconnect coupler and fittings. Each attachment shall be connected and separated from the hydraulic quick coupler system in the manner prescribed by the manufacturer. Each attachment connection and separation will be timed.

4.3.2 Rock drill. A minimum of 4 holes, using a 4.5 inch drill bit, will be drilled in Granite (with a minimum compressive strength of 32,000psi) to a minimum depth of 36 feet. Drilling rates will be averaged by dividing the total distance drilled by the elapsed time.

4.3.3 Noise level. Noise levels shall be measured in accordance with SAE J88, J919, and J1166. Failure to comply with the provisions of 3.5.1 shall constitute failure of this test.

4.3.4 Human factors. Excavator induced vibration to the operator shall be tested in accordance with SAE J1013.

4.3.5 Engine. The engine will be tested using aviation, kerosene type turbine fuel, grade JP-8.

4.3.6 Low temperature start and operation test. The HYEX shall be subjected to a low temperature test, consisting of cold soak and two consecutive starts, at -25°F. Then the HYEX shall be subjected to a low temperature test, consisting of cold soak and two consecutive starts, at -40°F. Temperature stabilization at -40°F shall be measured at the following locations:

- a. In the two center cells of each battery between the plates and at mid-depth of the electrolyte.
- b. In the center of the hydraulic system reservoir.
- c. In the engine oil system.
- d. In the engine coolant.

The excavator shall be started at -40°F with preheating with the assistance of the Arctic/cold weather starting kit. It shall start within 5 minutes of initial attempt, not including 45 minutes preheat time. Smooth engine running without unnatural or continued control manipulation shall be attained within 15 minutes after starting. After the engine operation has stabilized and the hydraulic fluid has been allowed to reach proper operating temperature, all excavator functions shall be operated. Failure to start at either -25°F or -40°F within 5 minutes, failure to obtain a smooth running engine within 15 minutes, inability to operate or perform any excavator function or evidence of damage, deformation, breakage, or leakage of fluid, shall constitute failure of this test.

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4.3.7 Rail transport. To determine conformance with 3.15.1, the excavator shall be inspected for agreement with the dimensions of the Department of Defense clearance profile for the Strategic Rail Corridor Network (STRACNET) diagram and be subjected to a rail impact test in accordance with the AAR.

4.3.8 Highway transport. The HYEX, Type I, II, and III, shall be tested and inspected to verify compliance with transportation height requirements when transported on an M870 trailer.

4.3.9 Slinging and tiedown provisions. All lifting and tiedown provisions shall be tested in accordance with MIL-STD-209.

5. GENERAL INFORMATION

5.1 The contractor will be notified of the following requirements.

- a. When test and inspections are required.
- b. When Arctic/cold weather starting kits are required (see 3.12).
- c. Top coat color (see 3.17.).